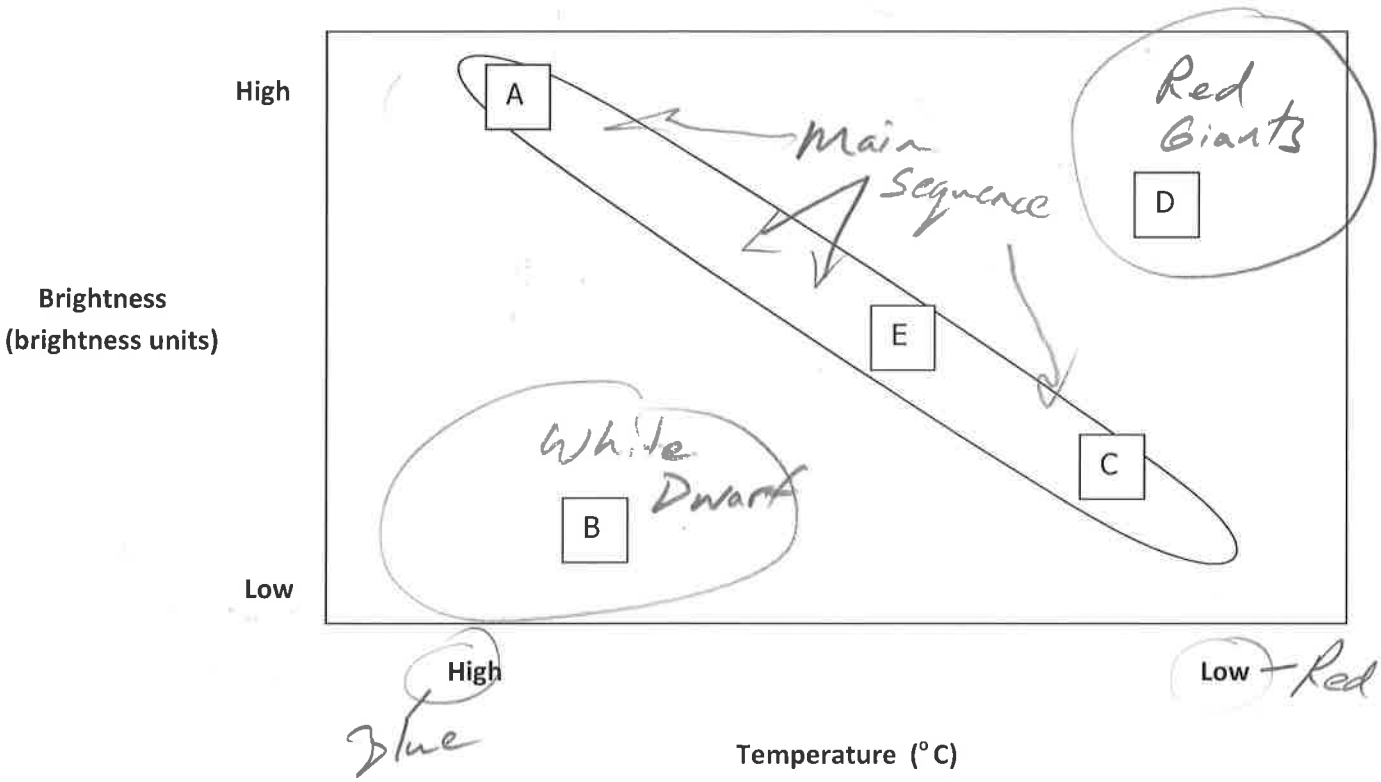
ESS 100 (Stapleton)
Star Lifetimes, Part 2

Name: B 1/2

Use the Hertzsprung-Russel diagram (H-R diagram) below to answer the following questions. Mark the correct letter as indicated on the chart. The boxes represent stars



16. What is the name of this type of diagram? Hertzsprung-Russel Diagram

17. Where are the hottest stars in the diagram? The left side

18. Where are the brightest stars? Top

19. Which of the stars are *main sequence* stars? A, E, C

20 What do all *main sequence* stars have in common?
They are fusing hydrogen into helium

21. Which star is the brightest?
A

22. Which star would be considered a red giant?
D

23. What star is most likely to be a white dwarf?
B

24. Which star has the hottest surface temperature?
A

25. Which letter could represent the present day Sun?
E

26. Which star is most likely to be blue?
A

27. According to current scientific understanding, the universe came into existence in an event called the

The Big Bang.

a. How large was the universe at the first moment of this event?

Infinitely small

b. How long ago did this happen?

13.8 billion years ago

c. How do we know the age of the universe?

28. Briefly describe three pieces of evidence that support the Big Bang theory.

1. Almost all galaxies have a red-shift, which means they are moving away from us. Farther galaxies have stronger red shifts.

2. Cosmic Background Radiation (CMB)
This is "heat" left over from the early moments of the Big Bang. We can still see this heat spread throughout the Universe

3. The Universe is about 75% Hydrogen and 24% Helium. Before we knew this, the Big Bang theory predicted it.

The Doppler Effect: How we know that all (almost) other galaxies are moving away from us and that the Universe is therefore expanding.

1. "Frequency" describes the number of waves which are received every second. Make a single clicking or tapping sound. Now make some clicks at a frequency of one cycle (click) per second. Now increase the frequency to two cycles per second. The pictures below show some waves produced by clicking. Label them to show which show the highest and lowest clicking frequencies.



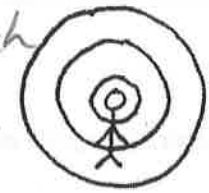
Highest

Lowest

2. "Pitch" describes the highness or lowness of a sound. Find a zipper, a comb, or some rough fabric. By zipping the zipper, strumming the comb, or by scraping something across the fabric, you can make a sound. When you strum faster, what does that do to the pitch? Raises, +

3. When you strum a comb or zip a zipper, you are making a series of clicks. As you strum a comb, each tooth of the comb emits a single click. The individual bumps on rough fabric each make a click as you drag a toothpick across the fabric. How does an increase in click frequency affect the pitch of the sound?
High frequency = High Pitch

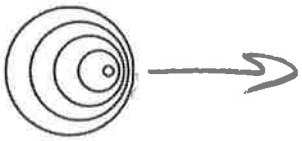
4. The people on the right are giving off sounds, who is creating the highest pitch?


Low

High.

5. One of the diagrams below shows a sound source moving to the right. The other shows the sound source moving to the left. Label them appropriately. Then show the locations where a listener would hear a high pitch sound and a low pitch sound.

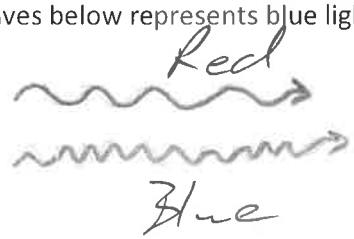
Moving Rightward

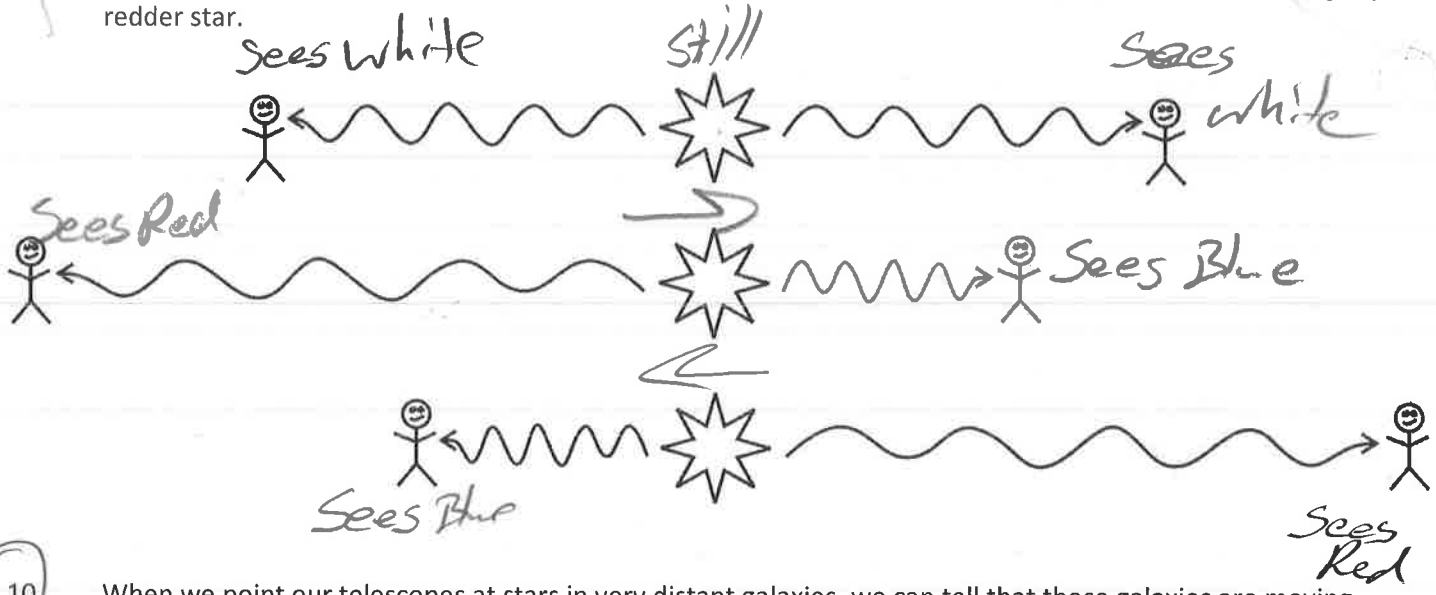
6. What happens to waves in front of a moving object? Are they compressed or stretched out?

7. When we listen to a train that is approaching, we hear a sound that is shifted _____ (higher or lower) than the actual sound of the train.

8. One of the waves below represents blue light, and the other represents red light. Label them appropriately.


Red
Blue

9. The diagrams below show three white stars and light leaving those stars. For each star, show its direction of movement (if any). Then tell whether the observer would see a white star, a slightly bluer star, or a slightly redder star.



10. When we point our telescopes at stars in very distant galaxies, we can tell that those galaxies are moving away because the light from those stars is _____ (red-shifted or blue-shifted). This provides evidence for the Big Bang because it shows that the Universe is expanding.